Name:

at1117paper: Complete the Square (v302)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 30 feet. Their combined area, found by adding the square's area and the rectangle's area, is 400 square feet. What is the value of x?

Example's Solution

$$x^2 + 30x = 400$$

To complete the square, add $\left(\frac{30}{2}\right)^2 = 225$ to both sides.

$$x^2 + 30x + 225 = 625$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 15)^2 = 625$$

Undo the squaring.

$$x + 15 = \pm\sqrt{625}$$

$$x + 15 = \pm 25$$

Subtract 15 from both sides.

$$x = -15 \pm 25$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 10$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 60 feet. The total area, of the square and rectangle, is 864 square feet. What is the value of x?

$$x^2 + 60x = 864$$

$$x^2 + 60x + 900 = 1764$$

$$(x + 30)^2 = 1764$$

$$x + 30 = \pm 42$$

$$x = 12$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 28 feet. The total area, of the square and rectangle, is 533 square feet. What is the value of x?

$$x^2 + 28x = 533$$
$$x^2 + 28x + 196 = 729$$
$$(x + 14)^2 = 729$$
$$x + 14 = \pm 27$$
$$x = 13$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 24 feet. The total area, of the square and rectangle, is 297 square feet. What is the value of x?

$$x^2 + 24x = 297$$
$$x^2 + 24x + 144 = 441$$
$$(x + 12)^2 = 441$$
$$x + 12 = \pm 21$$
$$x = 9$$